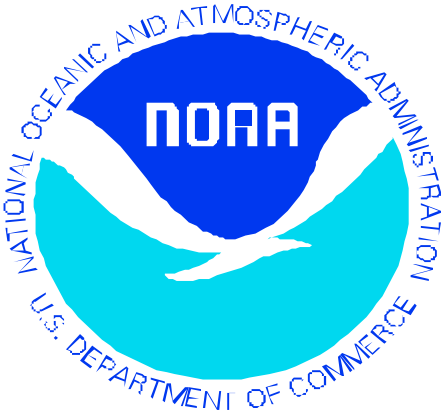
Asian Dried Seafood Market Analysis

by

Duff W. Mitchell

This report was funded in part by both:



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The Alaska Science & Technology Foundation

Forward

The Saltonstall-Kennedy (S-K) Grant Program was created to fund industry research for the specific purpose of making the American fishing and seafood processing industry strong and vibrant. This program funds cutting-edge research projects that would not or could not be funded by private industry. Over the years, the focus and the bulk of S-K funding has moved into the areas of fishery and resource research. This current research project is squarely directed to the development needs of the seafood industry and has the specific purpose of expanding America's ability to meet changing and emerging global seafood markets.

Alaska and the remainder of the U.S. are blessed with a rich abundance of fishery resources. In general, the U.S. does a fair job at managing its fisheries resources. Greater attention is now being given to management, harvesting, and processing strategies better able to "sustain" these resource so that they remain available perpetually. Despite our best intentions, we still harvest species that are unwanted in the marketplace. These fishery resources become "bycatch". The total cost of processing, transporting, and marketing bycatch fishery products frequently exceeds the value that the market is willing to pay for them.

The following research material represents two years of continuous investigation conducted by numerous individuals from many countries. The reports and analyses contained in this S-K project final report provide an informative basis for American seafood operators wishing to determine if the production of dried seafood products is appropriate for their companies. This report is essential reading material for any seafood processor looking to expand their market presence in Asia. This S-K research project reveals detailed and specific new market opportunities for American seafood processing operations in this broad and heavily populated marketing region.

The general report outline is as follows:
For ease and speed in selection and/or downloading, selected reports are stored on this CD (or at this Web site) as individual PDF files.
I. Introduction. ***PDF file #1***
II. Market reports. ***PDF files - #2 - 38***
III. Development and production of product prototypes. ***PDF files - #39 - 47***
IV. Introduction of product prototypes in Asian markets and market viability analyses. ***PDF files - #48***
V. Recommendations to industry. ***PDF file - #52***
VI. Credits and references.

I. Introduction:

The Alaska Food Group submitted this S-K Grant proposal to the National Marine Fisheries Service (NMFS) during the 1996 request for proposals period. Our goal was to conduct an Asian dried fish market analysis and an industry demonstration project to determine if the market, the currently available fishery resources, and available processing technology were suitable to permit the launching of an American-made dried fishery product company. Alaska Food Group identified an untapped market for Alaskan and American-produced dried fishery products in Asia. Our initial pre-grant research indicated that a large and mature dried fishery market existed in Asia and that this expansive market was being completely ignored by American seafood producers.

Our reasons for entering into this project are several. Among these various considerations is the fact that Alaska is faced with a large bycatch problem where a large tonnage of usable fish are discarded annually. As suggested, the bycatch problem is created because the market value for these discarded "usable" fish is lower than the total cost associated with their processing, marketing, and transporting. The participants in this S-K project believe that fish drying provides an alternative to traditional frozen fish processing. Different cost variables are involved and this type of processing provides many cost advantages over the traditional freezing of fish. Drying takes less energy and electricity to process fish on a pound for pound

basis. The final dried fish product is most commonly shelf stable and requires little or no refrigeration costs to store the product. Furthermore, it is less expensive to transport a dried non-refrigerated fish product than a frozen one.

The combination of abundant and underutilized source of raw material; a large potential market for these resources; and a new method of processing these resources into marketable products created the rationale and catalyst for this project and report. It is with this background and viewpoint that this project was submitted and funded.

The following was the original presentation and proposal submitted to NMFS.

Project Title: Dried fish Asian market investigation and analysis and an industry demonstration project to produce dried fishery products from underutilized salmon and bycatch species.

Background of problem:

Alaska is the world's primary producer of wild salmon. Alaska's role in the salmon world market has dramatically changed in the last ten years as market share and prices have eroded with the advent and explosion of world farmed salmon production. Farmed salmon competes with the more favorable species of wild salmon and has been gaining market share in Japan, Europe, and in the United States to the detriment of Alaskan salmon exports. Farmed salmon has a primary advantage in that it can be sold all year round in consistent and reliable quality. Another factor that is affecting the Alaskan salmon industry is that Russia is just beginning to tap their wild salmon resources. Their lack of harvesting and processing infrastructure has limited their ability to harvest wild runs from becoming fully exploited. Russia is beginning to harvest their underutilized fishery resources due to recent joint ventures and internal capitalization. Russian salmon and fishery resources enjoy a transportation advantage over Alaskan salmon due to their proximity to the Pacific Rim markets. The short-term impact of Russian pinks and chums will force lower prices for domestic salmon due to Russia's temporary tendency to dump product on the world market for hard currency. The long term impact of the Russian part of the equation is unknown and is dependent on the management and sustainable yield of their fishery resources.

Technology strides in aqua culture has lead to greater economies of scale in the farmed salmon industry. During market depressions, farmed salmon producers have and will continue to sell excess production on the market at low prices. Norwegian salmon farmers currently face punitive U.S. tariffs for their past "dumping" practices. The net effect of farmed salmon on Alaskan frozen chum and pink salmon is especially felt because a fresh farmed fish can be purchased for only a little more than these frozen salmon. Alaskan processors end up losing money on the meat (not roe) of these fish because their sales price does not cover purchase and delivery cost, processing cost and storage costs. Many processors are forced to liquidate their product rather than incur additional holding expenses. The downward selling price exacerbates the problem for the next processor that is forced to sell in order to liquidate inventory. Additionally, the vast majority of the Seattle-based processors continue to market chum and pink salmon in the same manner as they did ten years ago despite the market changes. Most pink salmon are canned and chum salmon are sold frozen H&G (headed and gutted).

Unfortunately for Alaskan fishers, the market is not going to get any better soon. The over-60 generation of consumers are the primary market for canned salmon and this market is shrinking annually. Frozen Chums are universally recognized as an inferior product to farmed coho and are currently filling cold storages with poundage that is difficult to sell. Alaska continues to face a salmon crisis with few solutions readily available. Many processors will not be able to transitionalize and withstand the fundamental change that is occurring in the industry. It should be noted that many Seattle-based processors are shipping Chums and Pinks to China for pin bone removal and filleting.

Many coastal processors have in the past legally and illegally ground up and "dumped" these low value species back into the water because the cost of traditional processing exceeds the value of the finished

product. Some processors attempt to eliminate or limit purchases of Pink salmon in an attempt to stay profitable when runs are strong and prices are low. The primary value of Chum salmon is in the roe, which makes harvesting for their meat uneconomical. As the Chum salmon move in toward their spawning streams their meat turns pale and their silvery skin changes to a purple and red-striped color. Many Southeast Alaska chums deteriorate to the point where their flesh is pale and paste-like even before they spawn. The meat from these fish is not appealing to consumers.

Chum or Keta caviar is superior to other forms of salmon caviar and Alaska's processors sold over $111 million in roe in 1995 (Source: Alaska Department of Fish and Game). Chum salmon have become the pollock of the 90's. Pollock were habitually harvested only for their roe prior to the advent of surimi products. In a similar manner, many fishers have found it to be more economically advantageous to roe-strip chum salmon and sell the roe to a caviar company rather than sell it to a traditional processor. Unfortunately, these caviar companies have no need or markets for the carcasses. The fishers, therefore, discard the carcasses (where legal) and sell only the roe. Large processors do the same in that many tenders discard pale meated Chum salmon on the fishing grounds rather than transport them back to the processor. The large processors have refused to purchase roe-stripped carcasses and refuse to pay the roe value of the whole fish. Each fisher must decide how to make a living and many have been forced to roe-strip as a result.

Southeast Alaska private non-profit hatcheries, whose boards are well represented by commercial fishing groups, have advocated the increased production of Chum salmon for the express purpose of roe harvesting. Many fishermen believe that they can only make a living in todays pressing market by selling roe. This roe-stripping strategy has severely impacted the harvest price for the natural runs of the Yukon and Kuskokwim Chum salmon. There are now very few buyers for these river chums because of the record production from Southeast hatcheries. The Fish and Game Commissioners working group on the salmon wanton waste regulations could not reach a consensus solution due to the vast differences in ideology and economics between the river harvesters and the Southeast harvesters.

There are no seafood products currently made from the late season roe-stripped carcasses and the meat cannot be readily sold due to its perceived poor quality. The fishers and the processors are now faced with a problem of getting rid of a salmon carcass that no one wants and that have no economic value.

On another front, the North Pacific Fisheries Management Council (NPFMC) has declared that it is their intent to eventually eliminate the dumping of the millions of pounds of groundfish that is annually discarded as bycatch from factory trawlers that operate off our coasts. NPFMC has received positive support from the general public and from within the industry. Bycatch reduction and the full use of the remaining bycatch are the primary concerns of NOAA and the National Marine Fisheries Service because the wastage of any fishery resource is not economically, environmentally, or politically sound. Many of the species that are currently discarded have high market values once they are further processed. The haste and pace in which the targeted species are caught by trawlers has necessitated the over side disposal of these species as bycatch. In addition, no American processor has developed a dried product from these bycatch species. The technology used in manufacturing dried fish products is largely of foreign origin because American companies have neglected to analyze and develop products for sake in this market. For example, dried pollock and dried skates are very popular in Korean as well as in many other Asian markets. Markets and market opportunities presently exist, but the industry has not been interested in or adequately encouraged to develop products. Alaska's underutilized fishery resources have not been domestically processed and marketed to the world dried fishery markets. However, many Alaskan fishery species that are currently being discarded in this region are already being dried and marketed by foreign processing operations. There is a current world demand for dried fishery products that will continue to grow as world population and national economies expand.

Dried fishery products are produced and sold in most countries of the world. In 1991 the market value of dried fishery products produced in the world was US$ 10.3 Billion (Source: FAO World Fishery Statistics). In 1991 the world produced 4.25 million mt of dried, smoked, and salted fish. The world markets exported 505,571mt for an export value of US$ 2.5 Billion (US$ 2.23/lb avg.). Dried cod hakes, and haddocks ac-

counted for 81,545 mt for a value of US$481,234,000 (US$2.68/lb avg.) (Source: FAO). Dried salted cod is by far the most competitive product on the world market. Other species theatre dried and have significant exports are: herrings, tunas, pilchards, and-eels, and various freshwater species. The United States does not currently have the technology or the marketing knowledge to successfully engage in this international market. The United States is a negligible participant the dried fishery product market even though it is a considerable producer of raw fishery resources.

The dried seafood product market is particularly competitive because consumers in specific market regions tend to prefer one species over another. In 1991 dried and cured fish products accounted for 5.6% of the world's fishery exports (Source: FAO). Dried fish is consumed on a regular basis in many regions. In some countries, Portugal serving as one good example, dried fish is a staple on family tables at least twice a week.

Dry salted, dry smoked, and dry seasoned fish are shelf stable. During the course of processing, the water weight of the fish has been decreased by more than 75% from its original fresh state. This moisture reduction will encourage the coastal Alaskan processing of dried products because transportation costs are minimized thereby creating a shipping advantage over heavier frozen product. The finished dried products also eliminate the necessity of costly cold storage facilities to store the dried fish.

The United States and Alaska do not engage in this important world seafood market despite the abundance of acceptable and inexpensive species that are suitable for drying. Our proposal takes this extensive problem of wasted and underutilized species, applies "state of the art" drying technology to this problem, and develops and replicates known dried product forms. Additionally, this project will produce a production cost analysis and a marketing analysis of the products produced. The goal of this project is to provide the necessary information to justify to the American seafood processing industry that it is profitable to convert our underutilized species into competitive products for world markets.

The required processing technology already exists to successfully convert the thousands of metric tons of bycatch that is annually dumped by trawlers and longline operations into marketable dried products that will be consumed by the world's growing population.. As we move toward full utilization, it is essential that we develop markets and product forms that will not just politically resolve the bycatch problem but will also economically achieve the goal of full utilization. This project was designed to initiate the industrial transformation of bycatch species and underutilized salmon into new and economically viable dried product forms.

Project goals and objectives:

Research, develop, produce prototypes and conduct a selected international market analysis of dried, dried-salted, dried-seasoned, and dried-smoked fishery products that can be produced from underutilized Alaskan salmon and trawl caught bycatch species.

1. Research and conduct investigative analyses of selected Asian dried fishery products and their markets: Korea, China and Hong Kong, Taiwan, Japan, and Singapore.

These countries were selected for the following reasons:

KOREA: In 1993, the Republic of South Korea imported 253 mt of dried fish that had a value of US$ 2.05 million (average US$3.69/lb) and produced 38,663 mt. of dried product. In 1997 Korea reduced its 20% tariff on processed fish to 5%. This will open the Korean market to imported dried fishery products as well as other processed seafood products. Many products that are currently being sold in Korea are made from species similar to those harvested in Alaska. In addition, Korea is the third largest importer of U.S. agricultural goods and is a proven market for other U.S. food products.

JAPAN: In 1993, Japan imported 25,580 mt of dried fish that had a value of US$382.4 million (average US$6.80/lb) Japan produced 923,200 mt of dried fish in 1993. This is a highly developed market that is

resistant to new products. However, seafood jerky has been gathering favor with the general population and there is promise that economical jerky products made from underutilized salmon and bycatch species could become profitable for U.S. processors.

CHINA and HONG KONG: These markets are very separate and are related only due to the unification of Hong Kong into the People's Republic of China on July 1, 1997. Within this extensive marketing region, it is well-known that dried fish consumption, preferences, and seasonings change markedly from one region to another. It is therefore important to understand the diversity of dried fish products as well as the particular preferences present in the various regions of China. Key players involved with the importation and distribution of dried products also change between these regions. It is important to recognize that Hong Kong and other seaports serve as gateways to China's interior cities.

In 1993, China imported 25,959 mt of dried fish that had a value of US$ 35.4 million. China produced 202,100 mt of dried fish and is the fourth largest producer of dried fishery products in the world. China's emerging middle and upper classes are demanding quality seafood products and are currently paying higher prices for high quality seafood products than Hong Kong (Source: Seafood Leader May/June 1996). In 1993, Hong Kong imported 12,715 mt of dried fish that had a value of US$ 244.38 million (average US$ 8.74 /lb). Hong Kong only produced 319 mt of dried fish internally. Hong Kong relies heavily on imports to support its dried fish consumption.

TAIWAN: Statistics in Taiwan are not reliable due to the misapplication of customs information. In addition, the United Nations does not track Taiwanese trade. Nonetheless , Taiwan is an important dried fish consuming nation with a market that could be as large as that found in Hong Kong. In addition, Taiwan has key trade links with mainland China that could be used to move American-produced dried fish into China.

SINGAPORE: In 1993 Singapore imported 4,759 mt of dried fish that had a value of US$ 46.8 million (average US$ 4.47/lb). Singapore is important to the goals of this study because the key distributors and processors in Singapore trade extensively with Malaysia, Indonesia, Burma, and Thailand. Many cultural ties and tastes can be found in all of these nations. Singapore is a regional distribution center and could be a vital market to market and distribute Alaskan dried fishery products.

Continuing with the discussion of project goals and objectives, this project obtained foreign-manufactured dried fishery products (natural and value-added) that have the potential of being made out of salmon and bycatch species of Alaskan origin. Foreign dried products were analyzed from a technical and marketing viewpoint. Carefully selected individual products were analyzed to determine the process(es) of how they were made, ingredients added, salt content, moisture content, and the vapor barrier packaging, if any, that is needed. Asian-Pacific Rim dried fishery products were investigated and analyzed in order to determine what products can be successfully and profitably processed using salmon and Alaskan bycatch species.

In the course of this project, foreign dried fish processors, importers, and distributors were contacted, interviewed, and enticed to impart how they process, market, and package dried seafood products. These individuals were contacted and interviewed in person as well as by phone, fax, and mail. These key individuals were encouraged to participate in the project so that they could be the first to determine if the new dried products from Alaska could be profitably provided to them to supplement their current product lines. These individuals will be encouraged to explore joint venture processing and marketing opportunities with U.S. processors in order to develop a dried fishery industry using Alaska's underutilized species. Receptive firms and participating individuals will be afforded future samples of prototype products for follow-up marketing research.

Marketing research described in this report consists of country-by-country analyses of dried fishery product consumption, type of species, and desired product forms. Also identified are the importers and distributors of dried products. The country selection process, as explained, was based on current imports and consumption of dried fishery products as well as on their market potential. Particular attention was given to cultural biases and nuances that could affect the market potential of imported products from

Alaska. Laboratory analysis will be conducted to ascertain the range of acceptable moisture and salt content for a given product form. Country import restrictions were investigated to determine country-by-country tariff patterns as well as any restrictions on the use of additives that are used in the production of dried fish products.

2. Develop and produce dried fishery prototype products utilizing bycatch species and underutilized salmon.

Based upon information obtained in the first phase, target products were analyzed in order to determine processing steps needed to process selected final products. Attention was paid to ensure compatible moisture, salt content, and seasoning levels had been obtained so that the end product has the greatest chance of success in its target market.

The S-K proposal called for the manufacture of natural formed products that were to be dried from whole, head and gutted, filleted, or sectioned fish using a state-of-the-art fish dryer. These products were to be analyzed to develop drying programs and processing regimens in an effort to enable the replication of targeted products. Products that are value-added will be attempted if they can be made with traditional processing equipment. In some cases, the lease or borrowing of specialized processing equipment will be made if it is determined that the benefit provided by this equipment outweighs the cost. It was also anticipated that specialized processing could be contracted out if the situation warrants. The proposal stated that prototype products would be made in sufficient quantities to adequately perform marketing sample distributions and have sufficient product available for trade shows.

A cost analysis was to be conducted on each major product in order to compare its competitiveness with its foreign produced original. Tariffs and transportation costs were to be incorporated after the calculation of the production cost in order to determine likely margins if the product was produced in Alaska. A detailed outline and report will be produced for each product form analyzed and replicated.

3. Introduction of product prototypes and subsequent market analysis to determine viability.

Prototype samples was sent to distributors and processors who cooperated in Phase 1 in order to determine if Alaskan product could effectively compete in local national market. It was envisioned that this feedback would enable future U.S. processors to determine if market entrance is viable. Additionally, prototype products were to be presented to dried fishery vendors in various markets to elicit feedback concerning their perspective. This feedback was to consider flavor characteristics, moisture, salt, acceptability to customers, and price comparisons with other dried fishery products.

Finally, the project called for the establishment of trade contacts and the distribution of samples to the contacted trading firms and with processors not originally included in the Phase 1 marketing analysis. These contacts were be done in person, personal phone calls, fax, e-mail, and personal mailing. Contacts and samples were also to be made with official Chinese trading firms in order to conduct market tests and establish product viability in China. China, with its growing population, emerging economy, high consumption of dried fishery products, and proximity to Alaska, make it the ideal target market for quality, cost-competitive dried fishery products.

II. MARKET RESEARCH REPORTS

Market reports were contracted out with the assistance of U.S. Agricultural Trade Offices and U.S. Foreign Agricultural Service offices. Consultants were selected on the following basis: Commitment to the projects goals; past experience in preparing similar type projects; recommendations from the trade and industry; and the willingness to work on a limited budget, yet produce realistic and detailed results.

Our consultants put in numerous hours of work over and above what they had agreed to. Most countries do not regularly keep data on dried fishery production, marketing information, product use, and prices. The

project investigators found it necessary to compile and synthesize this information from many sources and also the contacts who cooperated with these field workers. It should be mentioned that many foreign processing companies were leery about participating in a grant sponsored by the US government. The investigating consultants were able to overcome these and other barriers and were able to complete their reports in a timely and accurate manner.

The dried fishery information contained in the following reports is the most substantial information compiled on this subject matter in the English language to date. The equipment, the processing methods, the technological know how, and market insights in these reports is useful to every seafood processing company interested in developing a line of dried products.

The following is the general guideline followed by our in-country investigative consultants.

1. Historical development of the dried fishery industry
2. Overview of dried fishery processes used in each country
3. Market analysis of selected dried fishery markets
4. Individual foreign dried fish product market analysis
5. Consumer preferences, consumption, and expenditures
6. Traditional uses and recipes
7. Consumer willingness to try new products
8. Market size and market value
9. Trade margins and pricing information
10. Tariffs and import restrictions
11. Key producers, importers, distributors, and key contracts by country.
12. Directory of producers, importers, distributors, and key contacts by country.

Referenced Individual Reports in separate PDF files.

For ease and speed in selection and/or downloading, individual portions of this report are stored on this CD (or at this Web site) as separate Adobe Acrobat PDF files.

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General and reports by country

Korea report & photos - (Market Survey of the Korean Dried Fishery Product Industry) - ***PDF #2***
Japan report & photos - (Analysis of Dried Fishery Products in Japan) - ***PDF #3***
Japan - additional photos - (Japanese Dried Salmon Products) - ***PDF #4***
(Japanese Dried Salmon Products 2) - ***PDF #5***
(Japanese Dried Salmon Products 3) - ***PDF #6***
(Japanese "Rocky Salmon" Drying Process) - ***PDF #7***
(Japanese Dried Fish Plant) - ***PDF #8***
(Japanese Dried Fish Pet Food Products) - ***PDF #9***

China - multiple reports

China Overview report - (The Chinese Dried Fish Market) - ***PDF #10***
Yantai - photos - (Dried Scallop Processing in Yantai) - ***PDF #11***
(Yantai Open Air Dried Seafood Market) - ***PDF #12***
(Yantai Open Air Dried Seafood Market 2) - ***PDF #13***
China Coastal Cities report - (To the Saltonstall-Kennedy Project) - ***PDF #14***
Dalian report - (Investigation of Dried Fishery Products in the Chinese Market) - ***PDF #15***
Dalian - additional photos (Dalian Dried Seafood Market) - ***PDF #16***
(Dalian Dried Seafood Market 2) - ***PDF #17***
(Dalian Dried Seafood Samples) - ***PDF #18***
(Dalian Dried Fish Plant and HAACP Testing Laboratory) - ***PDF #19***
(Dalian Dried Fish Plant and HAACP Testing Laboratory 2) - ***PDF #20***
(Dalian Dried Pollock Plant) - ***PDF #21***
(Dalian Dried Pollock Plant 2) - ***PDF #22***
Shanghai photos - (Dried Fish Products at Shanghai Dept. Store) - ***PDF #23***
Guangzho photos - (Guangzho Dried Seafood Market) - ***PDF #24***
(Guangzho Dried Seafood Market 2) - ***PDF #25***
(Guangzho Dried Seafood Market 3) - ***PDF #26***
(Guangzho Dried Seafood Market 4) - ***PDF #27***
(Guangzho Unusual Products) - ***PDF #28***
Beijing photos - (Dried Fish products at a Beijing Seafood Show) - ***PDF #29***
(Dried Fish products at a Beijing Seafood Show 2) - ***PDF #30***
(Dried Fish products at a Beijing Seafood Show 3) - ***PDF #31***

More Country Reports

Hong Kong report - (The Hong Kong Dried Fish Market) - ***PDF #32***
Hong Kong photos - (Various Dried Fish Products Found In Hong Kong) - ***PDF #33***
Taiwan report - (The Taiwan Dried Fish Market Survey for Saltonstall-Kennedy Grant) - ***PDF #34***
Taiwan photos - (Dried Fish Products - Taiwan) - ***PDF #35***
Singapore report - (Singapore Market For Dried Fish) - ***PDF #36***
Singapore - photos - (Dried Seafood Sold at a Singapore Market) - ***PDF #37***
(Dried Seafood Sold at a Singapore Market 2) - ***PDF #38***

Development & Production of Prototypes

FITC report - (Sampling of Asian Dried Seafood Products - Initial Results) ***PDF #39***
FITC photos - (Packaging and Product Variety Samples) - ***PDF #40***
Aadland Marketing Group report - (Dried Fish Exports to Japan, Korea, China, Singapore & Taiwan - ***PDF #41***
Kake Product Line photos - (Scallops) - ***PDF #42***
(Octopus) - ***PDF #43***
(Squid) - ***PDF #44***

(Shark Fins) - ***PDF #45***
(Various Dried Fish Products) - ***PDF #46***
(Dried Surimi Process) - ***PDF #47***

Chinese Market Investigation of **Reintroduction of Dried Fishery Products from Alaska** - ***PDF#48***

Chinese Market photos - (Misc. product, packaging and merchandising techniques) - ***PDF # 49***
(Misc. product, packaging and merchandising techniques 2) - ***PDF # 50***
(Chinese Dry Seafood Processing) - ***PDF # 51***

Dried Fish Product **Export Economic Feasibility Stud**y - ***PDF #52***

III. DEVELOPMENT AND PRODUCTION OF PROTOTYPES.

Alaska Food Group investigated the samples brought to our plant from Asia and conducted an analysis to develop and produce prototype dried fishery products made from underutilized salmon and bycatch species. We used the following as our guideline in this phase of our grant research.

1. Target dried fishery products
2. Laboratory analysis
3. Processing analysis, processing methods, and equipment used to replicate products
4. Marketing and packaging analysis, list of labeling and packaging requirements, and customs by country.
5. Development and production of replicated products
6. Product cost analysis and proforma production schedule by individual product

1. Target dried fishery products.

American and specifically Alaskan species are well-suited for the manufacture of Asian dried fishery products. The two general types of products produced and sold in Asia are snack foods and commodity-type dried fish products that are used in soups and various traditional dishes. Snack foods are inherently smaller in size and are usually sliced and further processed than the above mentioned commodity products. Some Asian snack foods made from small minnow-type anchovies and other forage fish were not studied for replication because many of these species are not harvested or are not an available resource in this region. Fingerlings and other juvenile fish that would be of acceptable size are not generally harvest in Alaska. Many management schemes and laws prohibit the harvesting of immature resources. For these reasons, these type of products and species were not targeted.

Asian snack foods made from larger species are usually cut into thin strips or shredded. Squid and pollock are the primary species that are caught along the U.S. West Coast. However, eel, file fish, and certain other species that are readily consumed as snack foods in many Asian countries are not available in North America. Fish of any type can become a snack food if it is properly processed, seasoned, and made shelf-stable. Pollock was not an original snack food in the Asian market, but grew in popularity over time as an alternative to other indigenous species. Dried and seasoned pollock is now consumed all over the Orient and is provided in a variety of flavors depending on local tastes.

The health benefits associated with the consumption of fish and other seafood is more pronounced and understood in Asia than in America. In the countries studied, omega-3 oils are known by their components - DHA and EPA. These components are advertised in all countries. DHA and EPA are linked to brain development and this concept is used as a marketing tool for the promotion of children's snacks (make your child smart) and for those who are old and concerned about the development of senility. Additionally, dried fish products have been traditional snack foods in Asia long before research was conducted on the health benefits of consuming seafood.

Many dried seafood and fish products are consumed in bars as a snack to go along with alcohol consumption. In many Asian cultures, it is impolite to not have snack foods served to guests or patrons. Small dried fish and seafood are a regular item at many drinking establishments in Japan and Korea.

The other primary dried seafood product is a commodity or a staple-type product. Commonly this is whole or filleted pieces of fish that have been salted, seasoned, roasted, and then dried. The general lack of refrigeration and the desire for seafood has created a need for shelf-stable seafood items. Although the economies of the studied countries have grown and refrigeration has become common, people still do not want to abandon their traditional foods. Many dried seafood species are rehydrated through steaming or boiling into a soup. When poorer Asians eat seafood, it is likely to be a dried species that is rehydrated. Although dried products made from many species can be listed as being in the commodity category and are inexpensive, there are exceptions. Some of these exceptions to the general rule are the sea cucumber, scallop, and shark fin. These items command high prices and are very expensive when the quality is superb.

Commodity-type dried seafood species feed the masses. All Asians consume seafood and it is a valued protein over other proteins. An individual that can afford to eat fish daily in China is respected. Other Asians are similar to the Japanese in terms of their attitude of eating from the sea. If it is from the sea and is good for you. The best seafood is live seafood, followed by refrigerated and frozen, prepared products, and then dried products. However, even wealthy Asians will consume dried seafood because they will not easily abandon familiar dishes and tastes even when their wealth increases. They will eat less dried seafood in favor of fresher seafood, but increased income will not completely eliminate dried seafood consumption.

Specific dried fish products and some general categories of dried products were selected from each country for possible replication in Alaska. Dried squid and cuttlefish were found in each country in the form of snack food. It was interesting to find regional and seasonal differences in almost all countries. Another product, dried skates, are found in China, Singapore, Korea, and Taiwan. It is a “winter” food that is consumed when the weather is colder. This is in part due to the perceived medicinal properties of skate wings. The product is thought to benefits individuals suffering from arthritis and other joint conditions. Many Asian consumers prepare and eat skate wings and steamed whole skate during the winter to ward off or prevent arthritis. The point to be established here is that there are some forms of dried seafood that are regional and others that are found throughout Asia. Dried surimi was only found for sale in Taiwan.

The following are favored products listed by country: Japan - dried salmon (many variations), dried flounder, and dried herring China - dried salmon, dried flounder, dried mackerel, dried skate wings, dried surimi, dried scallops, and dried herring Hong Kong - same as China Taiwan - same as China. Korea - dried skate wings, dried surimi, and dried squid Singapore - dried salmon, dried skate wings, and dried surimi

2 Laboratory analysis.

The Fisheries Industrial Technology Center in Kodiak, Alaska, evaluated several varieties of Asian dried fisheries.
Refer here to separate FITC report - (Sampling of Asian Dried Seafood Products - Initial Results) in PDF format - PDF #39 (report) and #40 (photos).

3. Processing analysis.

Each selected product was evaluated at the production facility located at Kake, Alaska, with the assistance of the Fisheries Industrial Technology Center, a University of Alaska research facility. In addition, processing information was extracted from the individual country reports and from personal field observations. Air drying was used primarily in the more expensive snack food products. Commodity products are also primarily air dried, but they also can be sun dried in certain climates. In almost all instances, air drying was conducted in a tunnel air dryer. Many of the observed dryers were batch-type dryers. The Chinese dryers had numerous doors so that carts could be moved in and out of the dryer. Also, in China it is very popular to roast fish species after drying them. This gives a color effect, softens the fish, and imparts a flavor. Many dried fish used for snack food are immediately tenderized after being roasted. This tenderizing step softens the hard surface of the fish and further breaks down the proteins.

Three primary ingredients are used in the production of dried fish snack foods - sorbitol, MSG, and sugar. Although many Westerners consider dried fish to be salty, most Asian products tend to be sweet. In fact, many dried fish snacks are eaten by Asian children in a similar manner that candy is eaten here.

Dried Salmon - Salmon is found in many variations ranging from salmon powder in Taiwan to gutted whole salted salmon in northern China. Obviously the processing analysis for the production of a salmon powder is more complicated than that for producing a salted salmon. Salmon is popular in Japan, but less popular in China where it is not as well-known, but is gaining in popularity.

Salmon powder (Taiwan) - Salmon is boiled or otherwise heated and then mixed with a variety of flavors that are primarily sweet. It is then tumbled in a special type of roaster at high heat. Many of these powders are prepared on premises of Taiwanese department stores. The product is then packaged and sold in the store that made it. In addition, there are manufacturing/processing plants that can these powders in a pull top container that has a reseal-able lid.

Salmon pieces, chunks or strips (Japan) - The Hokkaido region of Japan produces a plethora of "Rocky" salmon that are versions of the Eskimo or Indian salmon strips commonly found in Alaska. The salmon is cut into strips and is brined for a short period of time to flavor the fish and to remove slime. It is then hung and dried in an air dryer. Some versions of this product are smoked for various periods of time before drying. Rocky salmon is primarily found in Hokkaido and is sold to tourists visiting the area. Because Rocky salmon is a tourist item in Hokkaido, it is not found in many other places for sale in Japan. Hokkaido Chum and Alaskan Sockeye were the two primary species used to make "Rocky" Salmon.

Salted salmon (China). Salmon was an indigenous species of northern China. Some speculation exists that salmon were also found in northern Korea at one time. The northern provinces of China import roe-stripped Hokkaido chum salmon and dry them. These salmon are gutted and with the heads still remaining. They are then heavily salted and dried in an air dryer. Pieces of salted salmon can also be found in the markets. However, whole salmon are preferred because consumers can inspect the whole fish to ensure that the salmon was properly prepared (sanitation and wholesomeness). Small pieces of fish are sometimes suspected to have originated from a poor grade of fish.

Dried skates and dried skate wings - Whole gutted and dried skates are found in Korea and northern China. The whole skates were found to be not longer than 36 inches, not including the tail. Slashes across the top flesh are made in the skates from northern China to facilitate drying of the thicker portions of the wings. The skates were naturally dried outside and also hung in an air dryer. The skates do not appear to be brined or flavored in any manner.

Dried flounder/yellow fin sole (China, Hong Kong) - This type of dried fish is not found at all in northern China, but is extremely popular in southern China. The flounder is butterfly cut and the guts removed. It is then dried flat in an air dryer. After it is thoroughly dried, the flounder is roasted in an electric conveyor roaster. The roaster imparts a dark color and gives the fish a "roasted" flavor that is very popular.

Dried surimi/cod fish. (Taiwan, Hong Kong) - This particular product is extruded into strips and then dried. Some varieties are very dry and crispy similar to potato chips and others are more chewy. The typical flavor is sweet.

Skate wings - Most varieties consist of the skinned and dried wings of very small skates. The skate wings found in northern Japan were imported from Thailand. These skate wings were skinned and dried in natural sunlight, a procedure that gives the product a whiter color than that produced during air drying and is more preferred. Also, packaged skate wings (consumer packs) were inspected for any foreign material, including metals, and then roasted in an electric conveyor roaster to sterilize the surface of the product.

Dried scallops - Dried scallops are enjoyed throughout Asia. Typically, they are naturally dried.

Dried mackerel - Mackerel and herring are dried whole. Herring are placed on a stick so that many can be dried together.

Dried pollock - Dried pollock is produced from frozen fillet blocks. The pollock is skinned and placed on a candling table to remove parasites. This is tedious work that is extensively conducted in many fish houses in China. Pollock is then placed in a tumbler to be dry brined. This is accomplished by mixing a preset mixture of salt, sugar, sorbitol, and MSG. The dry brining (tumbling) is carefully timed and the brined product is then removed and flattened so that the pollock fillets dry evenly. The pollock is then hard dried. Upon removal from the dryer, the pollock is then roasted which gives it a creamier color and a roasted flavor. The pollock is then tenderized by passing the product through a mechanical tenderizer a number of times until the pollock is powdery to the touch.

Dried shark fin - This is a high end product made from the fins and the lower lobe of the tail of most shark species. The fin is skinned and dried. Sun drying produces a whiter
colored fin that is more valuable than cream colored fins.

4. Marketing and packaging analysis, labeling, and customs requirements by country.

The Asian dried fish marketing and packaging analysis was performed by Aadlund Marketing of Anchorage, Alaska.
Refer here to separate Aadland report - (Dried Fish Exports to Japan, Korea, China, Singapore & Taiwan) - PDF #41

5. Development and production of replicated products

Asian produced products were analyzed in our Kake processing facilities to determine how they were made and how best to replicate them. We used the laboratory analysis from the Fisheries Industrial Technology Center to assist in this process. In addition, our pictures, recorded notes, and market reports identified some of the processes used to produce the dried fishery products selected for replication.

We procured raw material from several regional providers that cooperated in the development of this project. These providers include: Aleutian Pribilof Island Development Corporation (APICDA), Bering Sea Fishermen's Association, and the surimi blocks were supplied by Arctic Storm Inc. Suppliers also provided us with raw material from the factory trawl fleet. Chang International supplied us with scallops, mackerel, dogfish fins, and certain other species found on the Pacific West Coast. Skates were harvested from Southeast Alaska waters.

Production procedures followed our best analysis of how the products were made in their respective countries. However, we found that many dried fish items can be replicated in appearance, but flavor differences and tenderizing proved to be more difficult to backwards engineer or replicate.
Refer here to separate Kake Product Line photos - PDF #42 - 47

6. Product cost analysis and proforma production schedule on individual products

The costs for each product are dependent on the same variables that are common to all seafood processing facilities - raw material costs; labor; capital expenses for equipment; operating costs such as electricity, heat, and water; ingredients; packaging; and shipping. Simple economics dictate that small-scale production and prototype development is more expensive than operations running at large economies of scale. In our operation, we are able to capture waste heat through heat exchangers that are connected to diesel generators. The waste heat is captured in glycol and then piped to our fish drying facility. The heat is then passed into the dryer under a temperature controlled system. In addition, we are able to completely heat our facility and generate hot water for all of our processing needs using this strategy. It is essential that a fish drying business carefully analyze each of the above cost variable in order to optimize the process and improve profitability by reducing each of these costs.

An economic feasibility study involving the transfer of dried seafood products from Alaska to Asian markets is addressed in the report provided by Professor Gunnar Knapp of the University of Alaska Anchorage. His feasibility and cost analyses make use of a spectrum of costs variables.

IV. INTRODUCTION OF PRODUCT PROTOTYPES AND MARKET VIABILITY ANALYSIS

1. Industry and trade feedback
2. Economic feasibility of exporting Alaskan dried seafood products to Asian markets.
3. Market summary and recommendations to industry.

1. Industry and trade feedback

Japan

Japan is a country that expects significant attention to detail in dried fishery goods. Small details that might go unnoticed by Western consumers are among the criteria that will determine whether a product will succeed or fail in this market. Japan blends traditional foods with a curiosity for foreign produced foods.

The introduction of salmon jerky proved to be the most successful product supplied to Japan from this project. The jerky was seasoned with a distinctly foreign flavor - hot. The selection of this flavor was determined by the importer. Although commercial quantities were sold and distributed, the product was not an overwhelming commercial success.

The jerky introduced was in the form of a solid strip. The importer did not sell the jerky in Hokkaido, a region that has the highest consumption and range of dried salmon products. Extruded types of jerky are not popular in Japan because it appears to be made from pieces of many fish. The typical consumer believes that these pieces may not have originated from the freshest or best parts of the fish. Beef jerky is a relatively new phenomenon that was introduced into the country by Japanese traveling to Hawaii. Japanese are more familiar with salmon jerky than they are with beef jerky.

It should be noted that chunked dried salmon called “rocky” salmon has found a popular niche in the Hokkaido region. Although many types of “rocky” salmon were hard-textured, a softer type is preferred. Typically, dried soft salmon has a 120 day shelf-life and is delivered frozen.. There is a trend toward a softer “half-dried” salmon that is easier to eat and more appealing to younger people who enjoy eating dried seafood in drinking establishments.

Our introduced “chunked” salmon had too much salt for the Japanese. Our product required some addition of salt to meet FDA requirements for shelf stability based on water-phase salt measurements. In addition, color and attention to other details are very important. Our demonstration “chunked” salmon product needed to be improved in the following areas - consistent cuts, better packaging, and the use of a multicolored label. It is clear that the shelf stability standards for Japanese dried items are different than those required in the United States by FDA. It was apparent that all Japanese plants visited were adhering to HACCP standards, but smaller shops in more rural areas still used the wind and sun for the drying of fish products.

The feedback on our other products varied. Dried skate wings produced from Alaskan species tended to be larger than what the Japanese consumer was accustomed to. Most dried skate wings are imported from other Asian countries such as Malaysia and Thailand. The smaller skate wings from these countries were commonly packaged in consumer packs that contain many small wings.

Dried herring and mackerel are found in Japanese grocery stores. They are meticulously placed on a wood stick through the head and laid on their side. Again, particular attention is given to the detailed presentation. For many consumers, the care given in the presentation equates to product quality. A product that is

presented carefully and professionally is assumed to have been processed in a clean plant that takes the same meticulous care in the preparation of the dried fish.

Our products were prototypes and did not have the same attention to detail required by the Japanese consumer. Industry feedback suggested that improvements in appearance is essential for American processed dried fisheries to succeed in the Japanese market.

Pet snacks produced from dried fish.

There is no customs duty on the importation of pet snacks into Japan. The barrier to entry is shelf space and the necessity of providing a product as carefully developed as that provided by Japanese producers. Packaging must meet or exceed the Japanese product standards. The typical Japanese pet snack manufacturer has an extremely high level of investment in the equipment and supplies used in the packaging of pet snacks. Many of these high quality Japanese pet snacks were found in Singapore and Taiwan as well. It was apparent that our dog snacks were not packaged to the level required by Japanese consumers.

Korea

We did not send all of our prototype samples to Korea. However, we showed our skate wings and salmon jerky during the course of a visit to Korea. Dried salmon is a foreign concept in Korea. Most Koreans know something about salmon, but have never heard of dried salmon. We showed several companies a very hot flavored salmon jerky. Many Korean dried fish snacks have a hot flavor. Salmon in jerky form was first introduced by a Canadian firm in the past couple of years. According to one source, it was only popular for a very short time and then disappeared from the store shelves. It was reported that the primary reason why it was not successful was that its quality was poor.

After discussions with several companies, it was determined that a large marketing effort would be needed to launch a salmon jerky in Korea. The price would have to be competitive with other dried fishery snacks as well as with beef jerky. Extensive marketing and sample production are necessary because salmon jerky is a new item and consumers will be reluctant to try a new item without being enticed through advertising or other marketing efforts. Also, imported dried fishery products must meet or exceed the quality of competing items produced by local producers.

Commodity-type dried fish products are readily sold in Korean markets. Whole dried skates from North America are acceptable in Korea. Dried skates are relatively expensive. However, the market demand is low for much of the year except in December and January when skate becomes a popular commodity. This is due to the Moon Festival during which dried skate is considered a traditional food.

There are some Korean companies producing dried surimi snacks. However none were found in Korean stores. This suggests that the Korean surimi companies are developing this product primarily for export. One Korean company displayed its new prototypes at the 1997 China Seafood Show.

Dried squid is the most important dried fishery product in Korea. It is also a benchmark dried product. If the price of squid rises, other dried fishery products become more popular. If the price of dried squid decreases, then dried squids accumulates market share during the lower price period.

Singapore

We submitted samples of dried skates, salmon jerky, and dried pet snacks to Singaporean companies. We met with one company that had imported a Canadian produced salmon jerky, but it did not sell well. The Canadian product had a strong aftertaste and did not have repeat sales as a result. Our product was evaluated by this company and was determined to be superior to the former product. However, they were reluctant to take on a dried product that was similar to the product that recently failed. This company represents and imports major foreign snack foods into Singapore.

This company representative suggested that Singaporeans like new products, but are cautious. Once they like a product, they will continue to buy it. Sampling is necessary to get Singaporeans to try a new food product. American style jerky tends to be hard, but Singaporeans like a softer texture and mouth feel. In addition, "jerky" is a poor name under which to market dried fish (or beef). Most Singaporeans do not know what jerky is. The term "jerk" in English is not a positive word and many Singaporeans refrain from trying any type of jerky as result.

Our pet snacks made from salmon skins were imported and test marketed by another company. The feedback was positive, but cost and packaging was a concern. Singaporeans are a pet loving people. However, many dogs are not from that part of Asia and tend to develop skin conditions in hot and humid weather. Many veterinarians suggest that pet owners feed their dogs fish to help minimize some of these skin conditions. Dried, boneless salmon has a market in Singapore if it can be produced at a low enough price compared to other types of pet snacks.

Dried skates - Most Singaporeans consume fresh skates and our dried skates did not receive any interest.
Refer here to separate Singapore report - (The Singapore Market for Dried Fish) - PDF #36 and photos - PDF #37 & 38

Taiwan.

We sent numerous samples and conducted sales in Taiwan.

Dried salmon flakes - Although our flavors did not match the typical Taiwanese tastes, we were able to conduct sales. Our American-produced flakes or bits are made in an entirely different manner than those produced in Taiwan. Most Taiwanese products could be considered to be "shredded dried salmon". Salmon jerky sales were also somewhat successful in Taiwan. We sold and introduced a spicy hot and sweet flavored salmon jerky. The "sweet hot" flavor is popular in Taiwan. Many night stands in Taipei sell a sugary dried cuttlefish that is painted with a hot sweet sauce. We attempted to replicate a similar flavor of this item with limited success.

We started to ship dried skinless skate wings only to be beat out by a Thailand based producer of a copied product. The importer was selling the dried skate wings as a substitute for dried shark fin.

The Taiwanese market is diverse in that the population is made up of Chinese from several different provinces. The original Taiwanese prefer Japanese dried fish snacks due to perceived high quality and the traditional purchase of Japanese produced snack foods. Many Taiwanese dried fish companies replicate Japanese produced dried fishery products. A favored snack food in Taiwan is dried strips of codfish. These shredded strips are flavored hot and sweet. Some of these shreds were extruded and appeared to be baked. Our extruded surimi samples were not close enough to these marketed products for us to attempt an introduction into the Taiwanese market.
Refer here to separate Taiwan report - (To the Saltonstall-Kennedy Project) - PDF #34 and photos - PDF #35

China

Although no sales to China occurred mainly due to price concerns, we received considerable feedback. The Chinese market should be viewed as many large regional markets. We sent thirteen prototype products to China for market analysis to determine if Alaskan produced products could be profitably exported to various regions of China.
Refer here to separate report China report - (Market Investigations of Reintroduction of Dried Fishery Products from Alaska) - PDF#48

2. Economic feasibility of exporting Alaskan dried seafood products to Asian markets.

Refer here to separate report - (Dried Fish Product Export Economic Feasibility Study) - PDF#52

V. RECOMMENDATIONS TO INDUSTRY

Alaskan resources are varied from low value unwanted species which have little to no market acceptance to very high priced wanted species where marketability is only limited by supply. This study concentrated on the marketability of dried underutilized salmon and bycatch species to the Asian market. The current national and world political climate only encourages the wise use of limited seafood resources. Most of the seafood production areas of the world are currently overfished and even low valued species must be exploited.

The economic question of how to transform a low value raw material into a valuable consumer product that can be sold at a price that covers all costs of processing and transportation and yields a profit to the processor is considered everyday in many corners of the world. Countries with large populations and extensive coastlines maximize the use of their domestic maritime resources as a matter of national policy in order to feed their citizens. Up to this current period, Alaskan and other Pacific Coast based processors have been able to fish the top-end valuable fisheries resources and either throw overboard or otherwise avoid unwanted species. It appears that the days of wanton bycatch are waning and a new era is arriving where a species is either avoided or, if it is harvested, it is processed to an economically useful end. Drying these lower valued species is a viable solution.

Specific recommendations

1. Identify established dried seafood products in a targeted country and then use a backwards planning technique that starts with the consumer and the market price sold at retail and then works backwards to the catching of the resource. A clear picture of each step is necessary to identify every component and feature that is necessary to successfully process and sell a specific dried seafood product.

2. Select a target market or segment of a market and concentrate on penetrating that market. Our project was too broad to be effective. An alternative would be to concentrate on southern China dried fish snacks of the type that are sold in grocery stores. Focusing on one market area and a simple line of products that can sold through one distribution channel is more likely to yield profitable results. The targeted market and developed product should be developed using the information contained in this study as the starting point for a target analysis.

3. Many foreign dried seafood products can be found in Asian food stores in America. The analysis of the size of the domestic market and distribution channels was not undertaken in this study. However, Asian grocery stores provide useful information for identifying successful selling dried seafood items.

4. Support, promote, and encourage tariff reductions in countries that consume dried and value enhanced seafoods. High foreign tariffs impede the development and expansion of American produced seafood products. Many countries protect their domestic dried fish processing industry with high import tariffs in an effort to discourage willing markets from purchasing imported products. This study revealed that the U.S. government will have to work hard to reduce seafood tariffs during the course of trade negotiations. Many U.S. agricultural industries are actively working for the reduction of foreign tariffs for their marketers. U.S. seafood processors are not active players in this lobbying activity. Every 1% of tariff is a 1% cost that makes it increasingly difficult for U.S. products to compete with domestically produced products in these foreign markets.

5. Invite dried seafood technicians to assist in the development of American-made seafood products in order to better accommodate the tastes of a targeted foreign consumer population. For example, most Americans typically think that a dried seafood should be salty like a dried cod. In Asia, sweet and sugary items are just as prevalent as salted items. An understanding of the flavor profiles and expectations of the consumer is essential for a successful product. We found subtle flavor changes were insignificant to

Americans, but were significant to Asians.

6. Develop partnerships with foreign dried seafood producers and marketing companies to assist in creating a market for Alaskan produced dried seafood products. Another possible variation to this recommendation is to initially process the dried seafood item in the U.S. and then sort, weigh, and package the finished product in the importing country. The labor cost is generally lower in most target countries and the in-country importer is more knowledgeable about local packaging requirements. There are many Japanese, Chinese, Korean, Taiwanese, and Hong Kong companies that specialize in dried seafood production and sales. Alaskan dried seafood items are of interest if price and flavor issues can be met.

7. Many Chinese seafood companies actively desire American partners to supply unwanted resources to be dried in their factories for re-export and domestic sales. Many of these companies do not sell nationally and, although they are large companies, they may sell primarily to their provincial area. This recommendation is primarily directed to those companies already involved with foreign joint ventures.

Employ suitable technology and capital investment to lower costs and to create a competitive advantage over foreign dried fish producers. It appears that employing high speed extrusion devices that extrude fish formulas onto sheets that are then dried offer labor and processing time advantages. Capital investment in automated drying facilities can lower the per unit cost of dried snack type items. This recommendation would be best implemented by a processor that has solid marketing capabilities and is able to absorb the production generated by a high volume facility.

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Shawneen Conover and Yuan-fang Dong, North Pacific Fisheries Program,
University of Alaska Anchorage, Anchorage, Alaska
Chuck Crapo and Brian Himmelbloom, Fisheries Industrial Technology Center,
University of Alaska, Kodiak, Alaska
Wang Quikuan, Dalian Fisheries University, Dalian, China
Jiang Zhikai, Dalian Fisheries University, Dalian, China
Zhang Wenxiao, Dalian Fisheries University, Dalian, China
Jennifer Bean, Asian Market Access Pty. Ltd., Tokyo, Japan
Gregory J. Galik, Aadland Marketing Group, Inc., Anchorage, Alaska
Dee Richmond, D. Richmond & Associates Pte. Ltd., Singapore
Tomohiro Asakawa, American Embassy, U.S. Dept. of Commerce, Tokyo, Japan
Hyun-Doo Park, Pacific Consultants Corporation, Seoul, Korea
Gunnar Knapp, Institute of Social and Economic Research, University of
Alaska Anchorage, Anchorage, Alaska
Charles V. Trappey, National Chiao Tung University, Hsinchu, Taiwan

Assistance:
Scott Reynolds, Shanghai, China; Agricultural Trade Office, USDA
Daniel Martinez, Taipei, Taiwan; Agricultural Trade Office, USDA
Kyung Sun Yang, Seoul, Korea; Alaska State Office, Alaska DCED
Phillip A. Shull, Seoul, Korea; Agricultural Trade Office, USDA
Dale Good, Singapore; Agricultural Trade Office, USDA
Cong Anming, Dalian, China; Dalian Zhongtai Co.
Gu Shao Ping, Qingdao, China; Shandong, CCIB

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Wu Longsheng, Dalian, China; Chang International Inc.
Xie Bing, Qingdao, China; Chang International Inc.
Wang Qinyan, Qingdao, Chain; Yellow Sea Fisheries Research Institute
Zhen Bing, Zhoushan, China; Zhejiang Fisheries Research Institute
Rick Hubbard, Waverley, N.S. Canada; SouthWind Mfg. Ltd.
Charles Becker, Anchorage, Alaska, USDC
Chris Mitchell, Anchorage, Alaska, Alaska Fisheries & Development Foundation
Donna Parker, Seattle, WA, Arctic Storm Inc.
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market patterns and prospects /
PLACE: Rome :
PUBLISHER: Food and Agriculture Organization of the United Nations,
YEAR: 1983
PUB TYPE: Book
FORMAT: ix, 142 p. ; 30 cm.
SERIES: FAO fisheries technical paper ; 233
NOTES: Bibliography: leaves 137-138.
SUBJECT: Dried fish — Marketing.
Salted fish — Marketing.
Smoked fish — Marketing.
OTHER: Moen, Eli.

AUTHOR: Maynard, John A.
TITLE: Dried fish markets in Asia /
PLACE: Kuala Lumpur, Malaysia (P.O. Box 899, Kuala Lumpur) :
PUBLISHER: INFOFISH,
YEAR: 1983
PUB TYPE: Book
FORMAT: iv [i.e. vi], 54 p. : ill. ; 23 cm.
SERIES: ADB/FAO INFOFISH market studies ; v. 7
NOTES: "January 1983."
SUBJECT: Dried fish.
Dried fish — Marketing.
Dried fishery products — Asia.

TITLE: The production and storage of dried fish :
proceedings of the workshop on the production and storage of dried fish, Universiti Pertanian Malaysia, Serdang (Malaysia), 2-5 November 1982 /
PLACE: Rome :
PUBLISHER: Food and Agriculture Organization of the United Nations,
YEAR: 1984
PUB TYPE: Book
FORMAT: vi, 265 p. : ill. ; 30 cm.
SERIES: FAO fisheries report ; 279, supplement
SUBJECT: Dried fish.
Fishery products — Preservation.
OTHER: James, D.
Food and Agriculture Organization of the United Nations.
Workshop on the Production and Storage of Dried Fish (1982 : Serdang, Malaysia).

AUTHOR: Huntsman, A. G. (Archibald Gowanlock), 1883-
TITLE: The processing of dried fish /
PLACE: Ottawa :
PUBLISHER: F. A. Acland,
YEAR: 1927
PUB TYPE: Book
FORMAT: 16 p. : ill. ; 23 cm.
SERIES: Biological Board of Canada. Bulletin ; no. 9
Methods of handling fish ; 1
SUBJECT: Dried fish.

TITLE: Methods of handling fish.
PLACE: Ottawa :
PUBLISHER: F. A. Acland,
YEAR: 1927 1936
PUB TYPE: Book
FORMAT: 3 v. : ill. ; 24 cm.
SERIES: Bulletin / Biological Board of Canada ; nos. 9, 19, 52
NOTES: 1. The processing of dried fish — 2. Instructions in curing and packing pickled mackerel — 3. Instructions in curing and packing pickled herring by the Canadian method.

SUBJECT: Fishery products — Preservation.
Fishery products — Storage.
OTHER: The processing of dried fish.
Instructions in curing and packing pickled mackerel.
Instructions in curing and packing pickled herring by the Canadian method.

AUTHOR: Waterman, J. J.
TITLE: The production of dried fish /
PLACE: Rome :
PUBLISHER: Food and Agriculture Organization of the United Nations,
YEAR: 1976
PUB TYPE: Book
FORMAT: v, 52 p. : ill. ; 28 cm.
SERIES: FAO fisheries technical paper ; no. 160
ISBN: 925100103X
SUBJECT: Dried fish.

AUTHOR: Bello, Rafael Antonio.
TITLE: Developing a dried fish product suitable for use in Venezuela.
YEAR: 1977
PUB TYPE: Book
FORMAT: 171 l. illus.
NOTES: Thesis (M.S.)—University of Washington.
Bibliography: l. 161-171.
SUBJECT: Dried fish.
Dried fishery products — Venezuela.

TITLE: Processing and marketing of dried fish /
PLACE: Diliman, Philippines :
PUBLISHER: Special Studies Division, Planning Service, Office of the Secretary, Dept. of Agriculture,
YEAR: 1976
PUB TYPE: Book
FORMAT: v. : tables ; 28 cm.
SERIES: National Food & Agriculture Council. [Publication] ; 77-1, 77-5
NOTES: Cover title.
Pt.l. —pt.2. Panay Island.—pt.3. Negros.
SUBJECT: Dried fish.
OTHER: Guerrero, C. V.

AUTHOR: Economist Intelligence Unit (Great Britain)
TITLE: The market for dried fish and dried prawns in Nigeria.
PLACE: Ernakulam,
PUBLISHER: Marine Products Export Promotion Council,
YEAR: 1964
PUB TYPE: Book
FORMAT: 22 p. 24 cm.
SERIES: Market survey report
NOTES: Survey conducted by the Economist Intelligence Unit, ltd., London, on behalf of the Marine Products Export Promotion Council.
SUBJECT: Fish trade — Nigeria.

Fish trade — India.

AUTHOR: Investment Advisory Centre of Pakistan.
TITLE: Dry fish; a study.
PLACE: [Karachi,
PUBLISHER: Export Promotion Bureau, Govt. of Pakistan,
YEAR: 1969
PUB TYPE: Book
FORMAT: 18 p. 25 cm.
SERIES: E.P.B. commodity study series, no. 11
Pakistan. Export Promotion Bureau. E.P.B. commodity study series, no. 11.
NOTES: "For official use."
SUBJECT: Fishery processing industries — Pakistan.
Dried fish.

AUTHOR: Ames, G.R. Weng, P.A.
TITLE: Shrimp by-catch utilization in Mozambique.
SOURCE: Tropical science. 1995. v. 35 (3) p. 300-307.
PUBLISHER: London : Whurr Publishers Ltd.
STATE/COUNTRY: England
DATE: 1995
LANGUAGE: English
PUB TYPE: Article
PUB AGENCY: Non-US Imprint, not FAO
SUBFILE/LOCAT: DNAL IND
STANDARD NO: ISSN: 0041-3291
IDENTIFIERS: Fisheries by catch; Shellfish.; Shellfish fisheries.; Fishery resources.; Waste utilization.; Food products.; Cured products.; Dried fish.; Food supply.; Mozambique.
SUBJ CATEGORY: M210 FISHERIES MANAGEMENT
Q106 FOOD PROCESSING, FISH AND AQUATIC PRODUCTS

AUTHOR: Buckle, K.A. Souness, R.A. Putro, S. Wuttijumnong, P.
TITLE: Studies on the stability of dried salted fish.
SOURCE: Food preservation by moisture control / edited by C.C. Seow ; assistant editors, T.T. Teng and C.H. Quah.
PUBLISHER: London : Elsevier Applied Science Publishers, 1988. p. 103-115.
DATE: 1988
LANGUAGE: English
PUB TYPE: Book chapter
PUB AGENCY: US Imprint, not USDA
SUBFILE/LOCAT: DNAL IND
STANDARD NO: ISBN: 1851662618
DESCRIPTORS: Dried fish
Food processing
Appropriate technology
Storage life
Indonesia
Australia
SUBJ CATEGORY: Q106 FOOD PROCESSING, FISH AND AQUATIC PRODUCTS
Q116 FOOD STORAGE, FISH AND AQUATIC PRODUCTS

AUTHOR: Quilkey, J.J. Gunawardana, P.J.

TITLE: Some views on the economic appraisal of technological change.
SOURCE: ACIAR proceedings series. 1987. (19) p. 100-109.
PUBLISHER: Canberra : Australian Centre for International Agricultural Research.
DATE: 1987
LANGUAGE: English
PUB TYPE: Article
PUB AGENCY: Non-US Imprint, not FAO
SUBFILE/LOCAT: DNAL IND
DESCRIPTORS: Food industries
Demand
Technical progress
Economic analysis methods
Economic impact
Self sufficiency
Case studies
Dried fish
Developing countries
SUBJ CATEGORY: E700 DISTRIBUTION AND MARKETING
Q000 FOOD SCIENCE AND FOOD PRODUCTS, GENERAL
X100 MATHEMATICS AND STATISTICS

AUTHOR: Sumardi, J.A. Purnomo, H. Susanto, W.H. Putiati Darius Suryo, I.
TITLE: Marketing dried fish in East Java, Indonesia.
SOURCE: Food drying : proceedings of a workshop held at Edmonton, Alberta, 6-9 July 1981 / editor, Gordon Yaciuk .
PUBLISHER: Ottawa : International Development Research Centre, 1982. p. 47-50. ill.
DATE: 1982
LANGUAGE: English
PUB TYPE: Book chapter
PUB AGENCY: Non-US Imprint, not FAO
SUBFILE/LOCAT: DNAL IND
STANDARD NO: ISBN: 0889363331
SERIES: IDRC ; 195e
DESCRIPTORS: Dried fish
Food preferences
Storage life
Marketing
Java
Indonesia
SUBJ CATEGORY: Q116 FOOD STORAGE, FISH AND AQUATIC PRODUCTS
E700 DISTRIBUTION AND MARKETING

AUTHOR: Dey, V.K.
TITLE: Export of dried marine products and its future prospects.
SOURCE: Seafood export journal. Aug 1984. v. 16 (8) p. 9-13. ill.
PUBLISHER: Cochin, India : Seafood Exporters Association of India.
DATE: 1984 08
LANGUAGE: English
PUB TYPE: Article
PUB AGENCY: Non-US Imprint, not FAO

SUBFILE/LOCAT: DNAL IND
STANDARD NO: ISSN: 0037-010X
DESCRIPTORS: Exports
Dried fish
World markets
India
SUBJ CATEGORY: E700 DISTRIBUTION AND MARKETING
Q006 FOOD SCIENCE, FISH AND AQUATIC PRODUCTS

AUTHOR: Nakamura, K. Ishikawa, S.
TITLE: Studies on dried marine food. I. The influence of water activity on the quality of salted and dried fish during storage [Trakurus japonicus].
SOURCE: Bulletin - Tokai Regional Fisheries Research Laboratory. Mar
1983. (110) p. 69-74. ill.
PUBLISHER: Tokyo : The Laboratory.
DATE: 1983 03
LANGUAGE: Japanese (Summaries or abstracts in English)
PUB TYPE: Article
PUB AGENCY: Non-US Imprint, not FAO
SUBFILE/LOCAT: IND
STANDARD NO: ISSN: 0040-8859
SUBJ CATEGORY: Q116 FOOD STORAGE, FISH AND AQUATIC PRODUCTS
Q506 FOOD COMPOSITION, FISH AND AQUATIC PRODUCTS

AUTHOR: Young, R.H. Duran, L. Velez, J.F.
TITLE: Effect of process variables on the characteristics of dried/salted fish minces prepared from Mexican shrimp by-catch Use of solar energy for processing.
SOURCE: Tropical science. 1981. v. 23 (4) p. 269-282. ill.
PUBLISHER: London : Her Majesty's Stationery Office.
DATE: 1981
LANGUAGE: English (Summaries or abstracts in French Spanish)
PUB TYPE: Article
PUB AGENCY: Non-US Imprint, not FAO
SUBFILE/LOCAT: IND
STANDARD NO: ISSN: 0041-3291
IDENTIFIERS: Mexico
SUBJ CATEGORY: P130 ALTERNATIVE SOURCES OF ENERGY
Q106 FOOD PROCESSING, FISH AND AQUATIC PRODUCTS

AUTHOR: Bello, Rafael A. Pigott, George M.
TITLE: A new approach to utilizing minced fish flesh in dried products.
SOURCE: Journal of food science Mar/Apr 1979. v. 44 (2) p. 355-358,362. ill., charts.
PUBLISHER: Chicago, Institute of Food Technologists
DATE: 1979 03
LANGUAGE: English
PUB TYPE: Article
PUB AGENCY: US Imprint, not USDA
SUBFILE/LOCAT: FNI
STANDARD NO: ISSN: 0021-1147
ABSTRACTS: A dried fish product to be kept without refrigeration was developed, using the mixed, minced flesh from various fish species (lingocod, rockfish, herring, and Pacific cod).

Modified tapioca starch, texturized soy fiber, and salt were required to enhance the binding and rehydration properties and sensory attributes of the product. Temperatures of 71-82 degrees C during approximately 10 hours were required to dry the patties to 5 percent moisture level; 20 minutes submerged in water were enough to rehydrate the product. Physiochemical, microbiological, organoleptical, and histological findings are reported.
DESCRIPTORS: Product development
Fish products
Proximate analysis
Dried fish
Sensory appraisal
Microorganisms
Food quality
SUBJ CATEGORY: Q100 FOOD PROCESSING, GENERAL

AUTHOR: Campbell, Marilyn.
TITLE: Stable tropical fish products
PUBLISHER: Ottawa : IDRC, 1975. 27 p. : ill. ; 25 cm.
STATE/COUNTRY: Canada
DATE: 1975
LANGUAGE: English
PUB TYPE: Book
SUBFILE/LOCAT: FNC
STANDARD NO: ISBN: 0889360502
ABSTRACTS: Representatives from 13 countries met in Bangkok, Thailand to discuss possibilities of producing low-cost, stable tropical fish production from underutilized species. The workshop aimed at formulating practical programs based on prime needs and major problems in producing, for human consumption, better fish products that will not deteriorate when held in storage for reasonable time periods. Topics included traditional products, non-traditional and industrial products, consumption patterns, available resources, by-catch utilization, product handling problems, practical steps for product development. The scientific viewpoint and practical constraints of producing pragamatic programs suited to the needs of developing countries were discussed. Two project proposals formulated deal with 1) improvement of traditional salted/dried fish products in tropical countries of Southeast Asia; 2) development of non-traditional products using minced fish obtained from trawler by-catches.
DESCRIPTORS: Tropical foods.
Dried fish.
Salted foods.
Fish products.
Food storage.
Food utilization.
Resources.
Product development.
Consumption patterns.
Developing nations.
South East Asia.

SUBJ CATEGORY: 200500 AGRICULTURAL PRODUCTS, GENERAL

AUTHOR: OSUJI, F N C.
TITLE: THE DRIED FISH COMMERCE IN NIGERIA: METHODS OF PROCESSING, STORAGE AND MARKETING IN RELATION TO PEST DAMAGE.
SOURCE: NIGER FIELD 41 (1): 3-18. REF. MAR 1976
DATE: 1976
LANGUAGE: English
PUB TYPE: Article
DESCRIPTORS: NIGERIA
SUBJ CATEGORY: 2005 AGRICULTURAL PRODUCTS, GENERAL

AUTHOR: RICKETTS, E. RODRIGUES, V.
TITLE: PROMOTING THE CONSUMPTION OF DRIED FISH IN A RURAL AREA IN KENYA.
SOURCE: CAN NUTR NOTES 27 (6): 37-44. JUNE/JULY 1971
DATE: 1971
LANGUAGE: English
PUB TYPE: Article
SUBJ CATEGORY: 15 AGRICULTURAL PRODUCTS (ECONOMICS AND TECHNOLOGY)

AUTHOR: Valdimarsson, G.; Gudbj ornsd ottir, B.
TITLE: The microbiology of stockfish during the drying process.
SOURCE: The Journal of Applied Bacteriology v. 57 (Dec. '84) p. 413-21 bibl il.
STANDARD NO: 0021-8847
DATE: 1984
PLACE: United Kingdom
LANGUAGE: English
RECORD TYPE: art
CONTENTS: feature article
SUBJECT: Fish as food - Microbiology.